January 16, 1862.

Dr. WILLIAM ALLEN MILLER, Treasurer and Vice-President, in the Chair.

The following communications were read:—

I. "On the Development of Striped Muscular Fibre in Man, Mammalia, and Birds." By J. LOCKHART CLARKE, Esq., F.R.S. Received November 21, 1861.

(Abstract.)

In the domestic fowl, until the beginning of the fifth day of incubation, the so-called voluntary muscular tissue consists only of a crowded multitude of free nuclei imbedded in a finely granular blastema; the nuclei are round, oval, pyriform, and somewhat angular, with granular contents. On the fifth and sixth days of incubation, fibres become superadded under two forms,—1st, as processes extending from the ends, or from the sides of nuclei; 2nd, as narrow bands, either uniformly delicate and pale, or bordered by darker outlines, and containing nuclei at variable intervals. They are most numerous near the surface of the layer, and probably belong, at least partly, to the muscular layer of the skin. In every case their first stage of development is conducted on one general plan, which consists in the fibrillation of the blastema along the sides of nuclei, to which the fibrillæ so formed become adherent. Sometimes these fibrillæ or lateral fibres enclose a single nucleus with conical processes of blastema, so that the object occasionally presents some resemblance to a fusiform nucleated cell. More frequently, however, they enclose a linear series of nuclei at variable distances from each other, but cemented together by blastema, which sometimes assumes around each a more or less definite shape. In the formation of the paler fibres, however, a series of neighbouring nuclei may sometimes be seen first to collect round themselves granular masses of a more or less fusiform appearance, and then to coalesce with each other, in an oblique or alternately imbricate way. Sometimes a series of the nuclei themselves overlie each other in an imbricate form like a

number of coins, and are cemented together by a common layer of blastema.

In the early part of the seventh day of incubation, numerous fibres of a much larger and more striking description suddenly make their appearance in the nucleated blastema. They originate, however, on the same general plan as the others, in a fibrillation of the blastema between, or along the sides of, a variable number of nuclei; but the process goes on to form aggregate masses of a much larger kind, and of a more or less oval, fusiform, or cylindrical shape, in which the nuclei are ultimately enclosed. Some of these bodies have a very striking resemblance to organic muscular-fibre-cells, which, according to my own opportunities of observation, are developed on the same general plan, that is, by the formation of sarcous substance, first, in the shape of fibres or lateral bands along the sides of a nucleus more or less encrusted with blastema, so that the *organic* muscular-fibre-cell would appear to represent an early stage in the development of the *striped* muscular fibre.

As incubation advances, the fibres acquire a tubular investment of the contractile or sarcous substance, which gradually increases in thickness or depth, and appears on each side as a band of corresponding breadth. As they grow in length, they also contract in diameter, and become of uniform structure throughout; while their nuclei rise nearer to the surface, and assume a more oval form. At this period the marks of striation, either longitudinal or transverse, are only faint and occasional.

By the fourteenth day of incubation, the entire substance of the fibres separates into longitudinal fibrillæ, which in turn become shortly resolved into particles or sarcous elements. After this the fibres continue to grow in thickness by the addition, to their surfaces, of new fibrillæ, which, as usual, are formed around nuclei encrusted with blastema cementing them, in such cases, to the original fibre.

In mammalia, although there are some particular but unimportant differences in the development of muscular fibre, the general plan is the same as in birds. The nuclei—at least in the ox, sheep, and pig—are larger, and have more distinct cell-walls or enveloping membranes. The fibres of the sheep or pig first make their appearance, in the fœtus of from half to three-quarters of an inch in length, as thick and nearly parallel threads lying amongst a densely crowded

mass of free nuclei. When isolated, these fibres are seen to be attached to one or more of the nuclei by a variable quantity of blastema. Sometimes a single nucleus with conical processes of delicate granular substance is first enclosed by fine fibrillæ or lateral bands, which present somewhat the appearance of a *cell-wall*, so that the object has a certain resemblance to a nucleated fusiform cell with a fibre originating from one of its extremities. Sometimes several nuclei are cemented in a group around a fibre, and become subsequently covered by other fibres of the same kind; and sometimes they lie in linear series, either at some distance apart, or overlying each other to a certain extent like a series of coins. The lateral bands or fibres enclosing the nuclei extend around them as a tubular investment, which grows in thickness from without, but not always uniformly on all sides. In the process of longitudinal growth, the nuclei multiply by subdivision, become generally more oval, and approach nearer to the surface of the fibre, which at the same time contracts in diameter. The subsequent changes they pass through are nearly similar to those which occur in the chick.

In man the development of muscular fibre proceeds on the same general plan as in birds and mammalia, but differs from that of both in certain unimportant particulars. In the early stages there is no distinct appearance of those oval, cylindrical, and irregular masses observable in the chick on the seventh day of incubation and in the mammal at a corresponding period. In this respect there is a greater resemblance between the two latter classes than between man and either. In the human fœtus, from about half to three-quarters of an inch in length, the first stage of development may be seen to commence by the formation of fine lateral bands or fibrillæ along one or both sides of one nucleus or more. When, however, there are more nuclei than one enclosed by the same lateral bands, they are always disposed in linear succession, with their longer axes in the direction of the fibre, and never occur in irregular groups, as is sometimes the case both in birds and mammals, in which, consequently, the same kind of fibres are often broader at first. Thus formed, they lie side by side in bundles of different sizes, to which new fibres or new fibrillæ are being continually added by a renewed process of development. Every fibre is the rudiment of several fibrillæ. At this period each lateral band constitutes a single fibrilla, which is often

resolved into sarcous elements of great distinctness and beauty, while new and similar fibrillæ are developed along its sides in the way already explained. The subsequent series of changes do not differ materially from those that occur in the inferior classes.

It is evident that this description of the development of muscular fibre is entirely opposed to the cellular theory of Schwann; while it agrees in some points with that of Lebert (Annales des Scien. Nat. 1849–50), but more with that of Savory (Phil. Trans. 1855). In no instance have I found that nucleated *cells*, properly so called, are concerned in the office of development; for the finely granular blastema attached to the nuclei, although it frequently assumes the shape of a fusiform *cell*, is not invested with a cell-*wall*, in the proper sense of the word. Such an envelope, however, is sometimes simulated by the investing sarcous substance or fine lateral fibrillæ when they are first laid down on the sides of the fusiform mass and meet each other at each extremity to form a single fibre or process. Indeed, according to my own observations, as already remarked, this is precisely the mode in which the *organic* muscular-fibre-cell is developed; so that the *striped* muscular fibre, instead of being the *product* of nucleated *cells*, would appear to be itself, at first, an instance or mode of cell-formation, which finds its prototype in the *organic* muscular fibre-cell, and in which the cell-*wall* is substituted and represented by the investing sarcous substance.

II. "On the Influence of Temperature on the Electric Conducting Power of the Metals." By A. Matthiessen, Esq., F.R.S., and M. von Bose. Received December 5, 1861.

(Abstract.)

In the first part of the paper we have described the apparatus used for the experiments, together with the precautions taken to ensure correct results; in the second we have given the results obtained with the pure metals—silver, copper, gold, zinc, tin, arsenic, antimony, bismuth, mercury—and the metalloid tellurium. The conducting power of the wires, or bars of each, was determined at about 12°, 25°, 40°, 55°, 70°, 85°, and 100° C.; and from the mean of the eight observations made with each wire (four at each temperature on heating,